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sults of original work are requested to state their preparation for the investigation they propose to undertake.

Under the rules of Washington University, persons entitled to candidacy in that institution for the Master's or Doctor's degree may elect botanical research work as a principal study for such degrees, if they can devote the requisite time to resident study.

WILLIAM TRELEASE,
Director.

ST. LOUIS, MO., May 8, 1895.

Botanical Notes.

The Pignuts. There is some question as to the exact distribution of the Common Pignut (*Carya porcina* or *Hicoria glabra*) and the related *Carya* or *Hicoria microcarpa*, and the undersigned will be grateful for herbarium specimens and especially nuts with their husks, representing both. In the recently published seventh volume of Professor Sargent's *Silvae*, the range of *glabra* is given as southern Maine to southern Ontario, through southern Michigan to southeastern Nebraska, southward to the shores of the Indian River and Peace Creek in Florida, and to southern Alabama and Mississippi, through Missouri and Arkansas to eastern Kansas and the Indian Territory, and to the valley of the Nueces River in Texas. *H. microcarpa* (treated in the *Silva* as a variety of *glabra*, under the varietal name *odorata*) is said to occur in eastern Massachusetts, Connecticut, eastern and central New York, eastern Pennsylvania, Delaware, the District of Columbia, central Michigan, southern Indiana and Illinois and Missouri.

WILLIAM TRELEASE.

Reviews.

A Monograph of the Mycetozoa. Arthur Lister, F. L. S. London. Printed by order of the Trustees of the British Museum.

Rostafinski's monograph of the Mycetozoa appeared in 1875, and with the appendix described about 230 species. Massee's "Monograph of the Myxogastres" was published in 1892; it

enumerates 430 species. Lister's volume comes to us dated 1894; it furnishes descriptions of 174 species "taken from specimens I have personally examined," and a list is appended at the end of each genus of "species not met with in the quoted collections;" this comprises about 100 species.

The basis of work in all three of these monographs is the same, viz.: *the types of the species of Rostafinski's monograph* in the collections at Kew, in the British Museum and at Strassburg. Of course the continued accession of specimens to these herbaria has augmented the material of each succeeding author, and important contributions appear to have been made to Mr. Lister's resources by several parties on this side the water.

Rostafinski, by reason of his original method, which involved a complete reorganization of the classification, necessarily reduced numerous species of the old writers to the condition of synonyms. Massee in general accepted the species as established by Rostafinski, while at the same time making numerous additions to this list from descriptions and material derived from American sources and elsewhere. Lister, however, while professing to follow in the main the arrangement of orders and genera given by Rostafinski, opens up afresh the question of species and proceeds to make a thorough and complete revision of the works of his predecessors. Upwards of *eighty* of the species of Rostafinski's monograph have disappeared in synonymy, united with other species, becoming reduced two, three and four or more into one. This involves at the same time the abolition of *five* of the Rostafinskian genera.

The manner in which species and genera are disposed of is sometimes remarkable. For example, it is suggested that the single species of the genus *Crateriachea* is but a variety of *Physarum cinereum* Batsch, and "a careful examination of the type specimen of *Heterodictyon mirabile* Rost. leads to the conclusion that it is a form of *Dictydium umbilicatum* Schrad." On page 89 eight Rostafinskian species are excluded from the genus *Chondrioderma*, four of them being unceremoniously dumped into *Trichamphora pezizoidea* Jungh; the single species of this genus is composed of five species of Rostafinski and one of Massee.

Of the numerous American species of Berkeley and Curtis, all

but two or three subside into synonymy. Peck and Rex come off a little better, a paltry half dozen or so being graciously allowed to remain to each. It is George Massee, however, who has to bear the brunt of the crush and to suffer the most acutely. Out of upwards of fifty new species named and described by him, only a single one is allowed to live, with the exception of two or three which are permitted to linger along until Lister can lay his hands on the types. This, too, it will be observed, is in addition to the Rostafinskian squeeze, the sum of which leaves Massee's volume in a sad state of collapse.

If the details of Lister's book are accurate and reliable, and the work is to be accepted as authoritative, then Massee's volume is a tissue of mistakes and blunders and a monument of ignorance—and *vice versa*. There is scarcely an agreement in spore measurements under any of the species, and the discrepancies are often immense. For example, the spores of *Lamproderma irideum* Massee are given in one volume as 11–15 μ , in the other as 6.5–8 μ . The measurements of sporangia exhibit the same diversity. Species appear under one genus in the one volume and under an entirely different genus in the other. *Didymium flavicomum* of Massee becomes *Physarum Berkeleyi* of Lister. The difference in treatment of the elegant genus, *Trichia*, by the two is something appalling; the number of species described by Massee is *thirty*, while Lister recognizes but *ten*. Massee's single genus, *Heterotrichia*, the only one he ventured to establish, is incorporated in *Arcyria ferruginea* Sauter. Two of Massee's species of *Lycogala* are excluded from the Mycetozoa! And *Tubulina spumarioidea* Cooke & Massee is declared to be nothing but the common fungus *Sepedonium chrysospermum* Lk.! The number of species that are occasionally got together sometimes rivals the synonymy of Rostafinski, and possibly a righteous retribution has now fallen on him for having made such havoc with the species of the old writers. For example, in *Physarum compressum* A. & S. are dumped four of Rostafinski's species, two of Berkeley's, three of Massee's and one each belonging to Balfour, Phillips and McBride. *Oligonema nitens* Libert is made a dumping place for eight different species, and he seems to have seriously considered whether he shouldn't dump the whole into *Trichia affinis* De B.

Mr. Lister has made a few attempts at novelties himself, which in the main are unfortunate. It is doubtful if *Physarum murinum* Lister is anything different from *Physarum pulchripes* Peck, as he has it. *Physarum calidris* Lister, on his own showing should be called *Physarum pusillum* B. & C., and the pretext for not doing so is perfectly flimsy. At any rate *Physarum nodulosum* Cke. & Balf. has priority; it was published as *Badhamia nodulosa* in the Journal of Mycology in 1889. If *Hemiarcyria stipitata* Mass. is to be absorbed in *H. clavata* Pers., with more reason should *H. intorta* Lister be included in the same species. The definition of his new order Margaritaceae is illogical; in fact, the order is unnecessary and the genera may easily be distributed elsewhere. The theory of the tubules in *Lycogala* is questionable; but if true the tubules are not a capillitium traversing the *interior* of the sporangia, but only "air-spaces" between them, in which case *Lycogala* goes to Reticulariaceae. The placing of *Chondrioderma* and *Diachaea* in Physaraceae is awkward indeed, and will receive the approval of no one. *Hemiarcyria* is a good Friesian designation much older than *Hemitrichia*. Something is said in the introduction concerning the "laws of botanical nomenclature," but it will be seen that the nomenclature remains a purely *personal* one, and that revision of the generic and specific names in the Myxomycetes is still a thing greatly needed.

We are of the opinion that Mr. Lister has shown too little respect for the labors of his predecessors and has exhibited a great want of consideration for the views and opinions of his contemporaries. We have a lurking suspicion that he is influenced by some strong personal bias greatly to the discredit of many of his statements; possibly it is only a yearning for notoriety. And we are inclined to look upon him as a narrow specialist, disqualified, by reason of his limited studies, for forming a proper judgment concerning genera and species.

A. P. M.

Untersuchungen über die Stärkekörner. By Dr. Arthur Meyer. With 99 cuts in the text and 9 plates. Jena, 1895.

This treatise will no doubt be welcomed by all scientific botanists. The author has made an earnest, conscientious effort to clear up some of the mysteries concerning the life history of the individual starch-grain. He admits that some of his conclu-

sions in regard to structure, imbibition, stratification and growth are yet theoretical. Our knowledge concerning the chemistry of starch is especially imperfect. It would be impossible to attempt to give a full summary of the author's investigations and results. The following are perhaps the most important conclusions:

1. The starch-grain consists of amylose, which separates into α -amylose and β -amylose, amylopectin, dextrin, isomaltose, and maltose. Of these substances amylose is perhaps the true starch-substance; the others are the result of processes of inversion.

2. Starch-grains are sphaero-crystals of amylose and amylopectin. This is evident from their optical behavior.

3. Amylose is split up by the starch-ferment diastase as follows: with the aid of water, the amylose molecule is converted into two or more molecules of amylopectin; this is converted into dextrin and isomaltose; a further process of splitting up converts dextrin into maltose, while isomaltose may also revert into maltose.

4. The starch-grain is porous. The pores are scarcely perceptible with the highest magnifying powers. The author makes a special attack upon Bütschli's "Wabenstructur" theory. Among other things he says, "Es ist höchst interessant zu sehen wie ein so vortrefflicher Beobachter (Bütschli) die Schaum und Wabenstructur mit welcher er sich eingehend beschäftigt, in die Objecte hinsieht," which, I think, expresses it rightly.

The following are some of the more important conclusions in regard to the biology of the starch-grain.

1. Starch-grains occur exclusively in the chromatophores. They may occur in any kind of chromatophore. The starch-grain of angiosperms originates and grows from the beginning until its final solution within a chromatophore.

2. Every starch-grain is entirely enclosed by the substance of the chromatophore. The author points out the difficulty of demonstrating the presence of the chromatophore substance.

3. The form of the starch-grain is more or less dependent upon the form of the chromatophore. The chromatophore substance does not always form an even layer over the starch-grain. The thickest portion of the chromatophore always lies in contact with the thickest stratifications of the starch-grain.

4. Several starch-grains may develop in one and the same chromatophore.

5. Solution of the starch-grain within the cell is due to the ferment diastase.

6. Stratification of starch-grains is still not well understood, it is perhaps due to a periodicity of growth (deposition of new layers), and to the action of diastase.

Part IV. comprises monographs on the biology of the starch-grains of *Adoxa moschatellina*, *Hordeum distichum*, *Dieffenbachia Seguine*, *Pellionia Daveauana*, *Hyacinthus orientalis*, *Oxalis Ortgiesi* and *Cyrtodeira cupreata*.

The treatise, which comprises 318 large octavo pages, is written in clear scientific style. Some of the cuts are poor. Taken as a whole, it is certainly the standard work on starch. It shows a great advance made since Nägeli's memorable communications on the same subject.

ALBERT SCHNEIDER.

Catalogue of Ohio Plants. W. A. Kellerman and William C. Werner (Geology of Ohio, 7: Part 2, 56-406. 1895).

Since the publication of Dr. Beardslee's "Catalogue of the Plants of Ohio" in 1874, a great amount of botanical exploration and critical study of the flora of the State has been accomplished, no less than 110 published papers and references to the plants of the area, during that period, being cited in the work here noticed. It was therefore highly desirable that these records should be brought together and incorporated with the unpublished results of the recent work of Professor Kellerman, his students and associates in the region. The duty has been discharged in a thorough and painstaking manner, as evidenced by the fine volume which lies before us, and we tender its authors the cordial congratulations of American botanists upon its completion.

The chapter on bibliography cites the titles of 132 papers and references, all but two or three of which have been examined. The arrangement of the families is that of Engler and Prantl, but in a reverse sequence, beginning with the Compositae and ending with the Myxomycetes. The nomenclature is based on the principles adopted by the Botanical Club of the American Association for the Advancement of Science.

N. L. B.